

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
17 July 2003 (17.07.2003)

PCT

(10) International Publication Number
WO 03/056971 A1

(51) International Patent Classification⁷: A45D 1/04,
1/00, 20/08, B26B 21/40

(74) Agents: CLARK, Robert, J. et al.; Hahn Loeser & Parks,
LLP, Twin Oaks Estate, 1225 West Market Street, Akron,
OH 44313-7188 (US).

(21) International Application Number: PCT/US03/00244

(22) International Filing Date: 6 January 2003 (06.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/346,921 8 January 2002 (08.01.2002) US
60/347,663 11 January 2002 (11.01.2002) US

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,
SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VC, VN, YU, ZA, ZM, ZW.

(71) Applicant (*for all designated States except US*): AMER-
ICAN DESIGN GROUP [US/US]; 1007 Shotgun Road,
Sunrise, FL 33326 (US).

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI,
SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventor; and

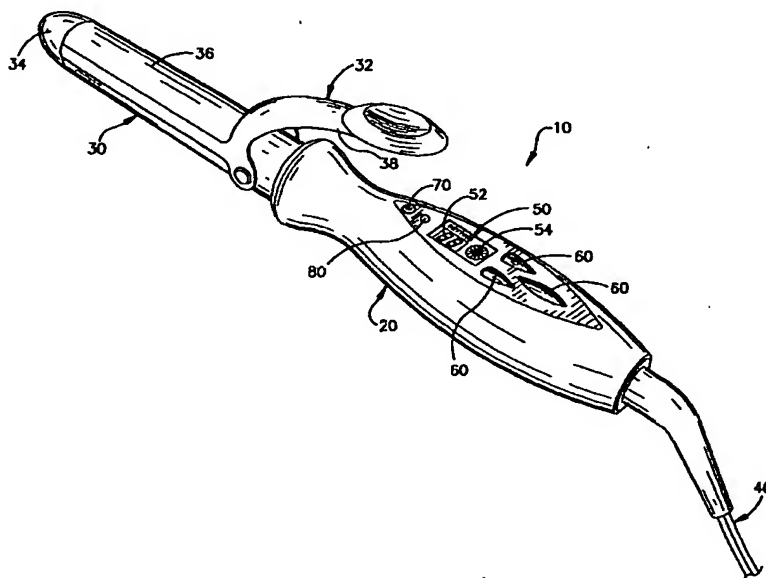
(75) Inventor/Applicant (*for US only*): RUBEN, David, A.
[US/US]; 1647 Island Way, Weston, FL 33326 (US).

Published:

— with international search report

[Continued on next page]

(54) Title: VISUAL USER INTERFACE FOR HAIR STYLING APPARATUS



(57) Abstract: The present invention is a heated hair styling device comprising a handle (20), a body (30), an LCD visual interface (50), and an audible signal (70) to notify a user of particular states of operation of the hair styling device. The LCD (50) display provides information of at least one operating condition of the device, for example, the temperature of the device, the heat setting, the amount of time that the device has been "on", etc.

WO 03/056971 A1



— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

VISUAL USER INTERFACE FOR HAIR STYLING APPARATUS

Technical Field

[0001] This application claims the benefit of co-owned U.S. Provisional Patent Application Serial Number 60/346,921 filed January 8, 2002, and U.S. Provisional Patent Application Serial Number 60/347,663 filed January 11, 2002, both incorporated herein by reference. The present invention is directed to a visual user interface for a heated hair styling apparatus and, more particularly, to a user interface comprising an LED (Light Emitting Diode) or LCD (Liquid Crystal Display) to allow the user to view a variety of operating characteristics of the heated hair styling apparatus which may be a hair dryer, curling iron, or the like.

Background of the Invention

[0002] Heated hair styling devices, such as curling irons, hair dryers, hair straighteners, hot rollers, and the like are well known. In recent years, many of these devices have been equipped with features such as temperature control and automatic shut-off. However, these heated hair styling devices are typically designed with little attention to the scope of the controls and level of feedback that its user receives. Generally, the user is presented with controls that do not accurately control the temperature of the device. Additionally, the controls may not allow the user to ascertain the operating temperature of the device. Without these capabilities of being able to accurately adjust the temperature or other operating characteristics of the device, the user is likely to be unable to sustain a desired hairstyle or look.

[0003] Capabilities to accurately control the operating conditions of a heated hair styling device would be beneficial to users. Therefore, in light of the foregoing deficiencies in the prior art, the applicant's invention is herein presented.

Summary of the Invention

[0004] The present invention overcomes at least one disadvantage of the prior art by providing a hair styling device comprising a handle; a body; an audio signal which sounds an alarm when at least one predetermined operating condition is achieved; and a liquid crystal display (LCD) visual display positioned on one of the handle and the body, wherein the visual display provides information related to at least one operating condition of the device.

Brief Description of the Drawings

[0005] FIG. 1 is a perspective view of a handle of a heated hair styling device having a user interface in accordance with the present invention;

[0006] FIG. 2 illustrates an LCD that may be used in conjunction with a hair styling device in accordance with the present invention;

[0007] FIG. 3 is a perspective view of a second heated hair styling device having a user interface in accordance with the present invention;

[0008] FIG. 4 illustrates another LCD that may be used in conjunction with a hair styling device in accordance with the present invention;

[0009] FIG. 5 is a perspective view of a another heated hair styling device having a user interface as shown in FIG. 6;

[00010] FIG. 6 illustrates an alternate version of an LCD that may be used in conjunction with a hair styling device in accordance with the present invention;

[0010] FIG. 7 is a perspective view of a third heated hair styling device having a user interface in accordance with the present invention;

[0011] FIG. 8 is a perspective view of a fourth heated hair styling device having a user interface in accordance with the present invention; and

[0012] FIG. 9 is an example of a circuit diagram used with the present invention as shown in Fig 1.

Detailed Description of the Invention

[0013] In this detailed description, reference is made to the accompanying drawings which, in conjunction with this detailed description, illustrate and describe a hair styling device having a visual user interface in accordance with the present invention. While specific devices, such as a hair dryer or a curling iron are shown, the present invention is not limited by such examples which are provided for illustration of the invention application.

[0014] Turning now to the drawings, FIG. 1, a hair styling device in the form of a curling iron, generally designated 10, in accordance with the present invention may have the well-known appearance of conventional curling irons. The hair styling device 10 may comprise an elongated, generally cylindrical handle 20, a rod-like body or barrel 30 joined in co-axial arrangement with the handle 20. The hair styling device 10 further comprises a clip-like tong 32, rotatably secured to the barrel 30 proximate to the junction of the barrel 30 to the handle 20.

[0015] The barrel 30 is typically comprised of a heat-conducting material, such as metal, which may be surface-treated to permit easy release of hair strands from the barrel after a curl is formed. The barrel 30 is typically tubular in form. The barrel may have a variety of diameters corresponding to a size or shape of curl desired by the user. One end of the barrel 30 is connected to the handle 20 so that the heater inside the barrel 30 may be energized by a power source from the handle 20. The end of the barrel 30 opposite the handle 20 has a tip 34 comprised of a non-heat conducting material, such as plastic, so that a user may hold the hair styling device 10 at both ends without touching the heated barrel 30.

[0016] Similar to the barrel 30, the tong 32 may be comprised of a heat-conducting material, such as metal. The tong 32 comprises a hair grasping portion 36 and a lever portion 38. The lever portion 38 of the tong 32 has an area that is covered with a non-heat conductive substance, such as plastic, so that the lever portion 38 may be depressed by a user's finger or thumb without touching the hot surface of the tong 32. The hair grasping portion 36 of the tong 32 extends along at least a portion of the length of barrel 30 and is arcuately formed so that when the tong 32 is in its closed position, its inside surface conforms to the curvature of the barrel 30.

[0017] The handle 20 is fabricated from a non-heat conducting, electrically insulated material, such as plastic. For instance, the handle 20 may be comprised of polyvinyl chloride with a rubberized paint coating. The handle 20 may be internally hollowed to receive a conventional electrical power supply cord 40. The power supply cord 40 is connected to a heating element (not shown) within the barrel 30 of the hair styling device 10. In a preferred embodiment, the heating element is a known

resistance type heater. The heating element may be comprised of a resistance wire encapsulated in an electrically insulating sleeve, also known as a rope heater; a resistance wire encapsulated in ceramic material, also known as a ceramic heater or mica heater; a positive temperature coefficient thermistor, also known as a PTC heater, or a mica heater; a gas powered heating element fueled by butane or similar gas fuel; or any other suitable heating element. The power level of the heater and power supply should be sufficient to maintain the temperatures required for curling hair. The heating element of the present invention may be heated by a power cord 40 as shown in the drawings and described above. The heating element may alternatively be powered by line voltage, direct current, batteries, a gas source, by transfer of thermal energy from a separate heat source, or any other appropriate power source, all of which are contemplated by the present invention.

[0018] The power supply in the present invention should be able to sustain a heating element temperature sufficient to curl hair. For instance, in one embodiment, the power supply should be able to heat the heating element to at least 90°C. In another embodiment, the power supply should be capable of heating the curling iron barrel 30 and maintaining temperatures of 120-200°C.

[0019] In addition, it is contemplated that the device of the present invention will have a rapid heat-up time; for instance, the power supply may enable the heating element to reach 120°C in approximately one and a half minutes. This heating time is presented for illustration only, and faster and slower heating times are contemplated by and should be considered to be included within the scope of the present invention.

[0020] The handle 20 of the hair styling device 10 comprises unique indicator and function control means. The handle includes a visual user display 50 shown in the form of a liquid crystal diode ("LCD") display means. The LCD 50 is powered by the power supply (e.g. 20) of the hair styling unit 10. A close-up view of the display 50 is shown in FIG. 2. The display includes a first operating condition indicator 52 of the device in the form of a temperature setting indicator 52. In one embodiment, the device 10 is programmed to assign a number or range of numbers to particular temperatures. For instance, the temperature settings may be set up according to the following table:

Table 1

SETTING	APPLICATION	TEMPERATURE (°C)
01-06	Very fine hair/fragile hair	120
07-12	Easy to curl hair	140
13-15	Normal/textured hair	160
16-20	Wavy/curly hair	180
21-30	Coarse/very thick hair	200

[0021] The above table is presented by way of example only and should not be deemed to limit the scope of the invention in any way. Temperatures or ranges may be assigned to various settings consisting of numbers, letters, descriptive terms (such as LOW, MEDIUM and HIGH) or other letters or symbols.

[0022] It is contemplated by the present invention that when the hair styling device 10 is powered on, a default temperature setting will be activated. The hair

styling device 10 will automatically begin to heat to that default temperature unless the heat is adjusted up or down by the user. For instance, in the numbering system shown in Table 1, the default setting may be the middle heat setting of 15. The default setting may alternatively be the lowest or highest setting. It is also contemplated that a user of a hair styling device 10 in accordance with the present invention could set her own default temperature which will be "saved" by the hair styling device 10 such that whenever the hair styling device 10 is powered "on", it will automatically heat up to the specific user's desired temperature.

[0023] In one embodiment of the present invention, the barrel temperature is controlled by a high speed switching diode. The diode acts as a sensor to cut off power and to maintain the temperature of the barrel at the setting selected by the user. Many switches for controlling electrical power to a device are known in the art. It is contemplated that any one of these switches or a combination of switches could be used to control the power to the heating element or LCD of the present invention.

[0024] For example, the present invention may comprise one or more "buttons" 60 to control the various functions of the styling device. It is contemplated that one of the buttons would be an "on/off switch", that a second and/or third button(s) would be used to select the temperature setting for the styling device. Additional buttons 60 could be added to control various other features of the styling device 10 such as timers, ion functions, heat bursts, cool shots, sleep mode, etc.

[0025] It is contemplated that the on/off button would function as follows: a user would press and hold the button for a short time, for instance one second, to switch the unit on or off. For the temperature control button, it is contemplated that a user

would press an "up" or "+" button to increase the temperature setting and a "down" or "-" button to decrease the temperature setting. For instance, one press of a "+" or "-" button would move the temperature setting one setting level up or down (e.g. from 15 to 16 or from 15 to 14). It is also contemplated by the present invention that the user could cause the temperature setting to go in "fast forward" or "fast reverse" by pressing and holding a "+" or "-" button.

[0026] The hair styling device 10 of the present invention may also include an automatic shut-off feature which will power off the heating element after the hair styling device 10 has been on for a predetermined length of time. As shown in FIG. 2, the LCD display 50 includes a second operating condition indicator 54 of the device 10 in the form of a "clock" which indicates to the user how long the styling device 10 has been in use. In one embodiment, the "clock" 54 comprises a circle divided into a number of wedge-shaped segments 56. Each segment 56 will flash or be illuminated for a certain period of time while the hair styling device 10 is powered on. It is contemplated that when the styling device 10 is first turned on, a first segment 56 begins flashing to indicate a first increment of time. However, it is also within the scope of the present invention to have all segments "on" when the styling device 10 is powered "on" and one segment 56 at a time may shut off or disappear to indicate the passing of an increment of time.

[0027] For example, in one embodiment of the present invention, the clock 54 is divided into twelve segments 56, each segment representing five minutes. When the hair styling device 10 is powered on, a first segment 56 begins to flash. After five minutes, this segment 56 will stop flashing and will stay in its "on" state.

Simultaneously, a second segment 56 begins to flash for five minutes. This goes on until all segments 56 are "lit", representing an hour (60 minutes). This will allow a user to track how long the styling device 10 has been "on". When all twelve segments 56 are "lit", the styling device 10 will either shut off or switch to a "sleep" mode. In the "sleep" mode, the heater for the styling device is powered "off", but the main circuit for the unit 10 is still running. The unit 10 must be disconnected from its power source to reset. It should be understood that this explanation is presented by way of example only and that many variations of this example are included within the scope of the present invention.

[0028] The LCD display 50 will typically have a background light which will turn "on" whenever any of the buttons 60 described above is pressed. The light will remain on for a short period of time (e.g. 1-5 seconds). If no other buttons are pressed within this time period, the light will turn off. The light may also remain on for the entire time that the heating element is powered on, however, this may be considered a waste of power.

[0029] The present invention may further comprise an alarm 70 or "beeper" which may be used to remind the user of the automatic shut-off or "sleep" feature. The beeper 70 may be configured to sound at a certain predetermined time before the unit shuts off the heating element. The beeper 70 may also be configured to sound at a plurality of predetermined time intervals prior to the shut-off of the heating element to provide the user multiple warnings of this occurrence. For instance, the beeper 70 may be configured to sound every six seconds for one minute prior to shut-off or

entering sleep mode. The beeper 70 may additionally be configured to sound when the unit 10 has reached the desired barrel temperature.

[0030] It is also contemplated by the present invention that the beeper 70 may have different sounds to indicate the various states of the styling device. For instance, the beeper 70 may sound multiple times in succession to indicate that the barrel 30 has reached a desired styling temperature. Conversely, the beeper 70 may have a different pattern or only one tone to indicate shut-off. Alternatively, different tones or patterns may be used to indicate different states. It is contemplated by the present invention that these indicators may be programmed into the styling device 10 before purchase or the user may have the option to select her preference for audible indicators in the styling device 10.

[0031] In another embodiment of the present invention, the styling unit 10 may also comprise a small light emitting diode (LED) light 80 on the handle 20. This light 80 can serve as an indicator of when the curling iron 10 has reached its desired temperature. For instance, when the hair styling device 10 is powered on, the light 80 will begin to blink. When the barrel 30 reaches the desired temperature, based on the setting, the light will stop blinking and will stay in its on or off position.

[0032] Referring now to FIG. 9, a circuit diagram 110 is shown for use in the present invention as shown in FIG. 1. The circuit diagram 110 shows, in general terms, the heater 112, AC power source 114, LCD display 116, audio buzzer 118, LED lights 120, clock 122, on/off switch 124, variable setting thermistor 126, and chip 124.

[0033] Referring now to FIG. 3, the hair styling device 10' is shown as a hair dryer. The hair dryer hair styling device 10' comprises a handle 20' and a barrel 30'. The outer shell portion of the hair dryer may be fabricated of a substantially non-heat conducting, and/or electrically insulated material, such as plastic. In typical hair dryers, a motor rotates a fan to achieve air flow through the hair dryer 10'. When power is supplied to the motor and the fan rotates, air is drawn into the hair styling device 10' through air inlets at the inlet grill 82. It is also contemplated that the air inlet grill 82 will be directly formed in a rear or side portion of the barrel of the hair styling device 10' or in an upper portion of the handle. The air drawn into the hair dryer through air inlets 82 passes over a heating element, typically found inside the barrel 30'. The heating element may be a conventional type heating element such as a resistance wire that is powered by the same energy source as the fan and motor. The heating element warms the air as it passes over the heating element before it is expelled from the hair styling device 10' through an outlet 84 in the end of the barrel 30'. The outlet 84 does not need to be completely open to accomplish the hair styling device's purpose. For the purposes of this invention, any means which will allow air to pass out of the air outlet of the hair dryer is considered an opening. For instance, the outlet end 84 of the barrel 30' may comprise slits or holes through which the air flows.

[0034] Similar to the previous embodiment, buttons 60 control the various functions of the device 10'. The hair styling device 10' also includes an LCD user interface 50'. The LCD interface 50' may be located on the handle 20' or the barrel 30'. It is contemplated by the present invention that the LCD 50' will be powered by

the same power supply as the motor and heater, for instance, power supply cord 40. The LCD display 50' is best shown in FIG. 4 showing a first operating characteristic or condition 52' of the device 10' and a second operating condition 54' of the device 10'. In the example shown in FIG. 4, the first operating condition 52 is the heat setting similar to that of the previous embodiment. The second operating condition 54' shown is the actual temperature of the device. The LCD display 50' could display a message indicating that the device has been powered on. The LCD interface 50' may also display many other pieces of information, such as length of time the device has been in use or any other information a user would want to know about the operating state of the device 10' dryer such as, but not limited to, a temperature change indicator, an airflow rate change indicator, a wattage consumption rate change indicator, and a shut-off timer.

[0035] Some of the changes in the operating characteristics of device 10' may not be apparent from a change in the sound of the motor. Accordingly, the present invention may further comprise an alarm or "beeper" 70 similar to that in the previous embodiment which may be used to remind the user of the various operating states of the device. The beeper 70 may be configured to after the hair dryer has been in use for a certain period of time. The beeper 70 may also be configured to sound at a plurality of predetermined time intervals during use of the hair dryer. Further, the beeper 70 may be used to indicate various temperature or air speed settings, a temperature change, an airflow rate change, a wattage consumption rate change, or that the device 10' is shutting off.

[0036] It is also contemplated by the present invention that the beeper 70 may have different sounds to indicate the various states of the styling device 10'. For instance, after the device 10' is powered on, it may take several seconds or more for the heating element or the fan motor to reach the desired temperature and/or speed. In addition, the device 10' may have an "auto shut off"/audible tone feature that works in the following manner: Every fifteen minutes, the beeper 70 will give off two long (2 second) tones which will serve as a time reference for the user. After 60 minutes the device 10' will emit 5 small beeps indicating the unit will now power off and go into "sleep mode". The beeper 70 may also sound to indicate that the device 10' has reached a desired state. The beeper 70 may have different patterns of sounding to indicate various conditions. It is contemplated by the present invention that these indicators may be programmed into the styling device 10' before purchase, or the user may have the option to select her preference for audible indicators in the styling device 10'.

[0037] Referring now to FIGS. 5 and 6, the hair styling device 10" is again shown as a hair dryer having handle 20 and barrel 30. The hair styling device controls 60 and LCD display 50 are integrated in a functional manner providing visual indication of five operating conditions of the hair styling device. The LCD display 50 depicts the heat setting 52 and air flow speed 58 as a plurality of boxes that light up between a maximum and minimum setting, each having a respective set of up and down controls 61 on handle 20. The plurality of square boxes 52, 58 will flash at the desired setting and will stop flashing when the heat become stable at the desired setting. The LCD display also signals whether the "cool shot" control button 63 is engaged indicated by

the letter "C" which indicates that the heater is off. The LCD display also signals whether the "ionic" control button 65 is engaged indicated by the letter "I" which indicates that the anti-static ion feature is engaged. The LCD display also includes a timer clock 54 comprises a circle divided into a number of wedge-shaped segments 56 similar to that shown in FIG. 2. These LCD display 50 may also be associated with an alarm as previously discussed, or can be used without the alarm feature. The LCD visual interface 50 showing operating conditions of the hair styling device would be especially beneficial to a user that has a hearing impediment or is deaf.

[0038] Referring now to FIGS. 7 and 8, an air brush 10''' is shown utilizing an LCD display 50 and a hair straightener/crimper 10'''' is shown utilizing an LCD display 50, respectively.

[0039] Accordingly, it should be understood that although the hair styling device 10 is represented by several examples specifically mentioned in this specification and shown in the drawings, other hair styling devices are within the scope of the present invention. LCD displays of operating conditions of the device and audible signal means could be coupled to devices including, but not limited to, hot rollers, cylindrical air curling brushes, etc. It should be understood that specific embodiments described herein are included by way of example only and that variations of these embodiments are within the scope of the present invention. The examples described herein should not be deemed limiting of the claims appended hereto in any way.

ClaimsWhat is claimed is:

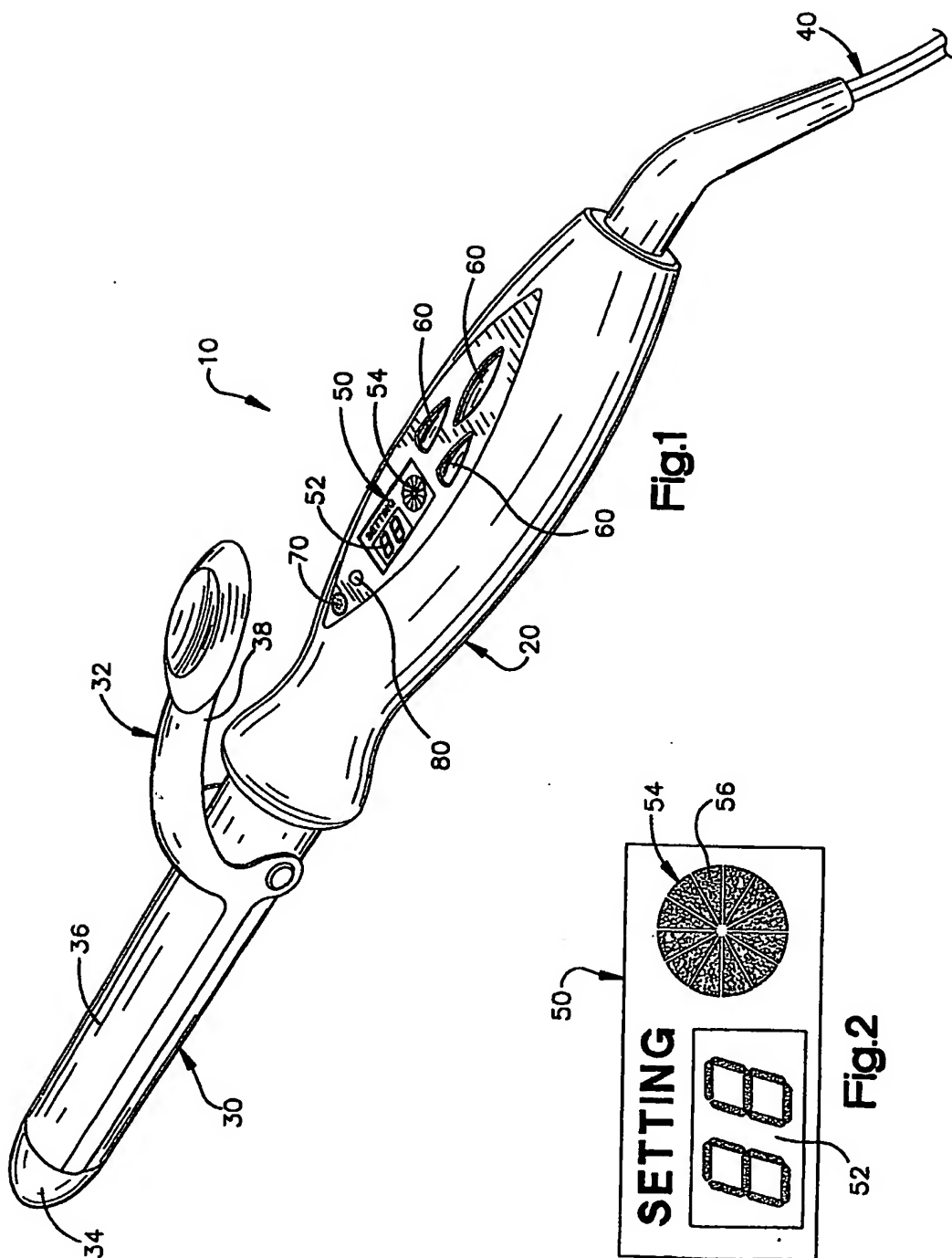
1. A hair styling device comprising:
a handle;
a body;
a liquid crystal display (LCD) visual display positioned on one of the handle and the body, wherein the visual display provides information related to at least one operating condition of the device;
an audio signal which sounds an alarm after a predetermined operating time at which time the device automatically shuts off.
2. The hair styling device of claim 1, wherein the visual display provides information related to at least two operating conditions of the device.
3. The hair styling device of claim 2, wherein the at least two operating conditions include a timer indicator and a temperature setting indicator.
4. The hair styling device of claim 2, wherein the at least two operating conditions include an actual temperature indicator and a temperature setting indicator.

5. The hair styling device of claim 2, wherein the at least two operating conditions include an actual temperature indicator and a timer indicator.
6. The hair styling device of claim 3, wherein the audio signal sounds an alarm when the operating condition of the device reaches a setting of the device.
7. The hair styling device of claim 1, wherein the hair styling device is a device selected from the group consisting of a curling iron, a hair straightener/crimper, and hot curlers.
8. The hair styling device of claim 1, wherein the hair styling device is a device selected from the group consisting of a hair dryer and an air brush.
9. The hair styling device of claim 8, wherein the at least one operating condition is selected from the group consisting of a temperature indicator, a temperature setting indicator, an airflow rate, a wattage consumption indicator, and a timer.
10. The hair styling device of claim 1, wherein the handle is rotatable with respect to the body by at least 180 degrees.
11. The hair styling device of claim 1, wherein the visual display further comprises a background light.

12. The hair styling device of claim 2, wherein the LCD provides both numeric and symbolic data.
13. A hair styling device comprising:
- a handle;
 - a body;
 - an audio signal which sounds an alarm when at least one predetermined operating condition is achieved; and
 - a visual display positioned on one of the handle and body;
- wherein the visual display comprises a liquid crystal display (LCD) which provides information related to at least two operating conditions of the device.
14. The hair styling device of claim 13, wherein the at least one predetermined operating condition is a predetermined temperature.
15. The hair styling device of claim 13, wherein the hair styling device is a device selected from the group consisting of a curling iron, a hair straightener, and a hair crimper.
16. The hair styling device of claim 14, wherein the LCD provides both numeric and symbolic data.

17. The hair styling device of claim 13, wherein the hair styling device is a hair dryer.
18. The hair styling device of claim 17, wherein the at least two operating conditions are selected from the group consisting of a temperature indicator, a temperature setting indicator, an airflow rate setting, and airflow rate, a wattage consumption rate indicator, and a timer.
19. The hair styling device of claim 13, wherein the display comprises a timer wherein the audio signal sounds an alarm when the timer indicator reaches a predetermined time limit.
20. A method of manufacturing a hair styling device comprising the steps of:
providing a handle;
providing a body;
providing electronic circuitry comprising an audio signal which sounds an alarm when at least one predetermined operating condition is achieved and an LCD display wherein the electronic circuitry is designed to provide at least one operational characteristic of the device to the LCD during operation; and
inserting the electronic circuitry into the handle and the body of the hair styling device such the LCD is visible on the surface of one of the handle and the body of the hair styling device.

1/4



2/4

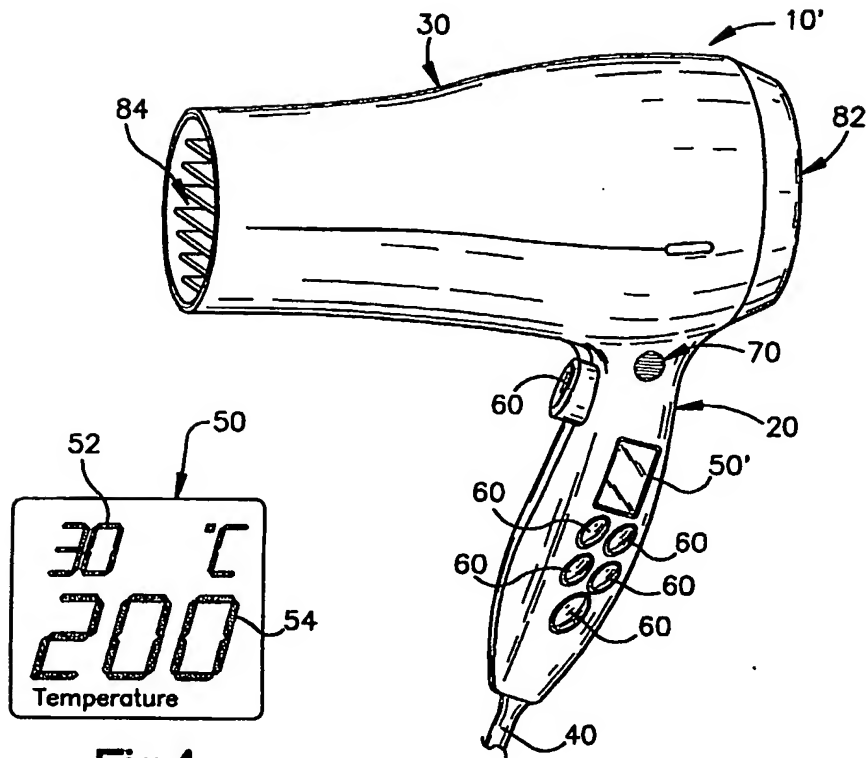


Fig.4

Fig.3

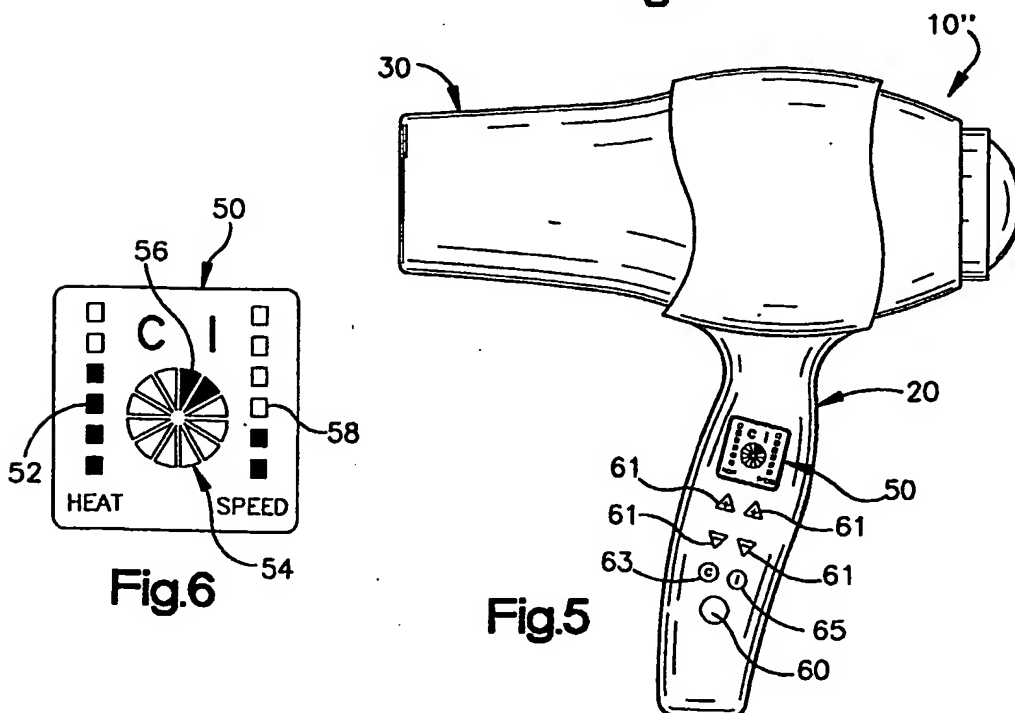


Fig.6

Fig.5

3/4

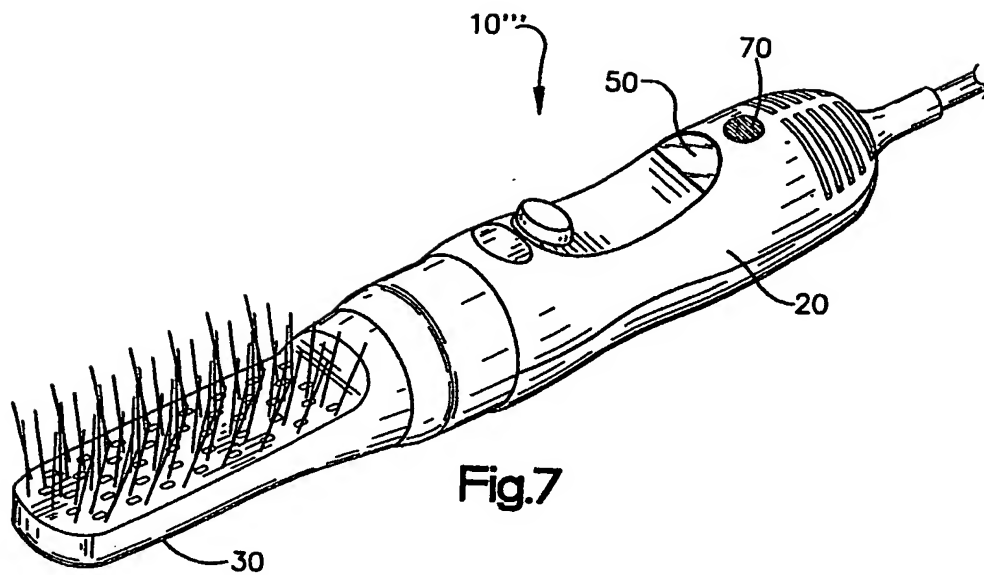


Fig.7

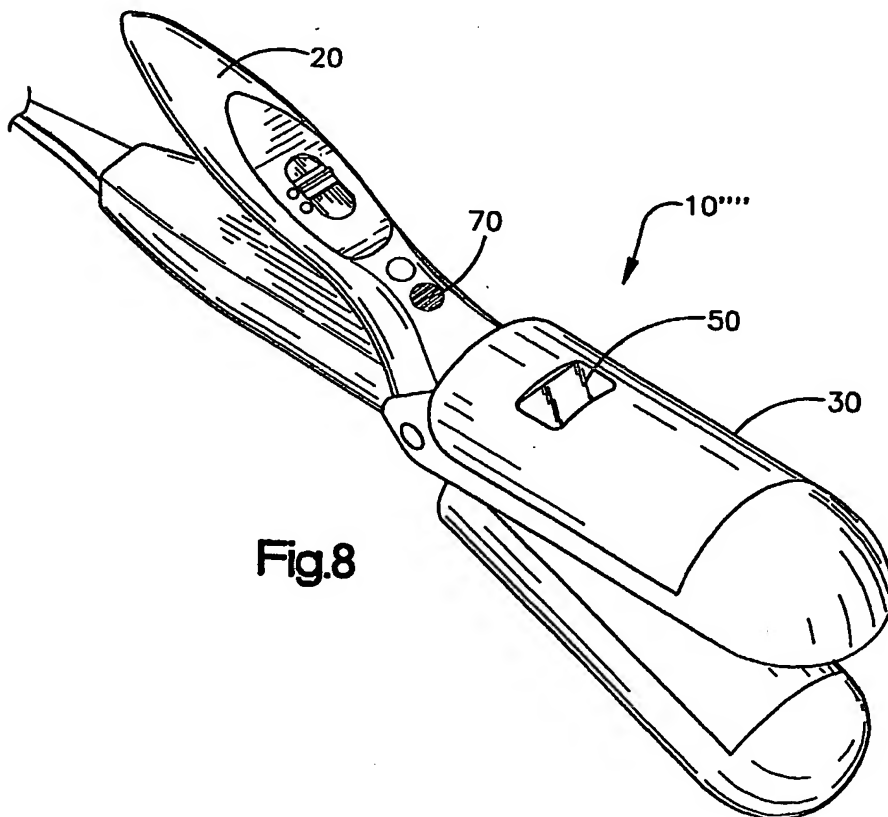
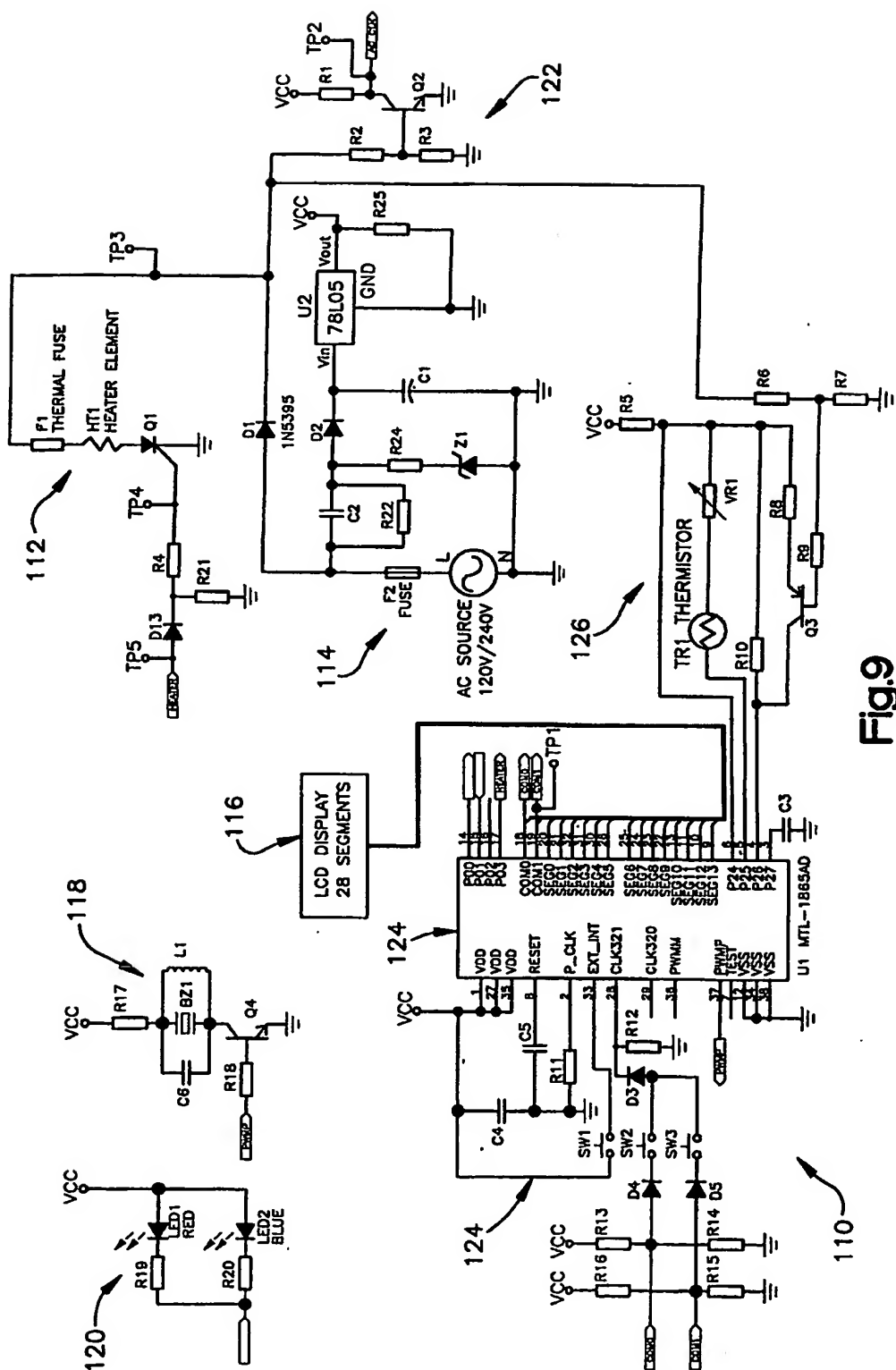


Fig.8

4/4



ଫି.ପ୍ର.୭

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/00244

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A46D 1/04, 1/00, 20/08; B26B 21/40

US CL : 132/232, 271, 269, 229; 30/34.05, 122, 123

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 132/232, 271, 269, 229; 30/34.05, 122, 123

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Esat text search, non patent literature search

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,174,311 A (FEHRMANN) 29 December 1992, fig. 2, whole document	1-20
Y	US 5,347,715 A (FRIEDLAND) 20 September 1994, figs. 1-5, whole document	1-20
A, P	US 6,497,043 B1 (JACOBSEN) 24 December 2002, figs. 1-3, whole document	1-20
A	US 6,032,365 A (HODGES) 07 March 2000, fig. 1, whole document	1-20
A	US 6,305,083 B1 (RIJKEN et al) 23 October 2001, whole document	1-20

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"A" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

02 MAY 2003

Date of mailing of the international search report

22 MAY 2003
 Name and mailing address of the ISA/US
 Commissioner of Patents and Trademarks
 Box PCT
 Washington, D.C. 20231

Facsimile No. (703) 305-3230

 Authorized officer

 ROBYN R. DOAN

Telephone No. (703) 306-9182